

REMARKS/ARGUMENTS

In the Office Action dated November 25, 2003, claims 1-32 were pending, with claims 1-15 and 22-32 being withdrawn from consideration. Claims 16-21 stand rejected. Claims 1-15 and 22-32 are cancelled. Accordingly, claims 16-21 are presently pending in the application. No new matter is added.

Applicants thank the Examiner for the thorough search and examination of the claims of the present invention, and respond to the comments in the Office Action as follows.

Claim Objections

The Office Action states that claim 20 is objected to for containing informalities. Applicants note that claim 20 was amended in the previous response to remove the term "as" from the claim to improve the clarity of the claim. Accordingly, Applicants respectfully request that the objection to claim 20 be reconsidered and withdrawn.

Claim Rejections - 35 U.S.C. §103

The Office Action states that claims 16-21 are rejected under 35 U.S.C. §103(a) as being unpatentable over the combination of Kolarov et al. (U.S. Pat. No. 6,144,773) and Chui et al. (U.S. Pat. No. 5,604,824). In particular, the Office Action states that the combination of Kolarov et al. and Chui et al. teach each and every element recited in claims 16-21, either alone or in an obvious combination. The rejection is respectfully traversed.

With regard to the present invention, Applicants first note that the main feature of the present invention is that wavelet coefficients can be derived from an image represented by a number of bit sets, or data elements, with each of the data elements typically having the same number of bits. The wavelet coefficients are derived using modular arithmetic to preserve information and speed data transmission. The wavelet coefficients from the image represented by the data elements are themselves represented by a number of bits that are no more in number than the number of bits used to represent each of the data elements because of the modular

arithmetic involved. This central feature of the present invention permits fast and compact transformation from data elements to wavelet coefficients, and is undisclosed in any of the cited prior art references. Independent claims 16, 20 and 21 all recite the features that each wavelet coefficient has a finite number of bits that are no greater in number than the number of bits for any of the pixels, and that the coefficients are produced using modular arithmetic. Accordingly, Applicants would like to specifically focus the examination of the present invention on these features, and call to the Examiner's attention the fact that these features are undisclosed in any of the cited prior art references.

In the Office Action, the Examiner states that Kolarov et al. provide for a wavelet transform having a same finite number of bits that are no greater in number than the highest count for the number of bits for any of the pixels of the image. The Examiner cites Figures 3a and 4a – 4c, as well as the description by Kolarov et al. at col. 19, line 19 – col. 20, line 13. In reaching this conclusion, the Examiner states that the features recited in the claims are provided by Kolarov et al., i.e., a same number of bits used to represent pixels as used to represent wavelet coefficients, and relies on the above noted particular portions of that disclosure for support.

Applicants note that while Kolarov et al. appear to discuss pixels and wavelet coefficients that are represented by a same number of bits, there is no disclosure that the wavelet coefficients are derived from the pixels with the same number of bits. That is, there is no stated relationship between the number of bits in a pixel and in a wavelet coefficient other than examples that happen to be the same. Kolarov et al. do not teach or explain how to derive wavelet coefficients that have a same number of bits as the pixels of the transformed image. Indeed, a review of Figure 3a and Figures 4a – 4c of the disclosure by Kolarov et al. reveals that the compression operations and procedures discussed are conducted on wavelet coefficients, rather than on pixels or other image representations. That is, the algorithm disclosed by Kolarov et al., especially in Figures 4a – 4c, focuses on operations performed after wavelet coefficients have already been obtained. Kolarov et al. reveal nothing with respect to obtaining the wavelet coefficients other than conventional techniques.

Indeed, the Office Action refers to the disclosure by Said – Pearlman that is incorporated by reference into the disclosure by Kolarov et al., which also reveals the information discussed in

the disclosure by Kolarov et al. at col. 19, line 19 – col. 20, line 13, as cited in the Office Action. In particular, Kolarov et al. reference Algorithm II of Said – Pearlman as being analogous to the algorithm disclosed in Figures 4a – 4c (col. 19, lines 25-32 and lines 55-64). Even a cursory examination of the reference by Said – Pearlman discloses that it is the conventionally obtained wavelet coefficients that are manipulated to transfer the maximum amount of information, i.e., the bits of significance, in the shortest amount of time. See section VI of Said – Pearlman, beginning on page 8. It is apparent that the disclosure by Kolarov et al. draws almost exclusively on the reference by Said – Pearlman to obtain an algorithm for generating significance bits as applied to a new type of data representation for a function on a manifold. Again, neither Kolarov et al. nor the reference by Said – Pearlman disclose a wavelet transformation wherein each of the wavelet coefficients are represented by a number of bits that are no greater in number than the number of bits representing each of the data elements of the data file once the transformation is complete.

In particular, independent claims 16, 20 and 21 all state that the wavelet coefficients are derived using modular arithmetic. This technique is aptly described in the specification of the present application, and indeed is referenced in following literature as an innovative technique for reducing computations and speeding compression and transfers of images. See Response to Paper No. 16, dated January 8, 2002. A summary explanation of the modular arithmetic technique was provided in the Amendment/Submission dated September 30, 2002 in response to the Office Action dated March 28, 2002. This arithmetic technique preserves the dynamic range of the information provided in the transformed pixel representations, while not increasing the size of the wavelet coefficient representation.

The wavelet transform using modular arithmetic to obtain wavelet coefficients represented by data bits that are no greater in number than the representations of the pixels is not taught in any of the cited prior art references, either alone or in combination. Because claims 16, 20 and 21 all recite this feature, Applicants respectfully submit that they contain elements not shown in the cited prior art references, and should therefore be allowable over those references, either alone or in combination. Accordingly, Applicants respectfully request that the rejection of

claims 16, 20 and 21 under 35 U.S.C. §103(a) over Kolarov et al. and Chui et al. be reconsidered and withdrawn.

Claims 17-19 depend upon and further limit claim 16, and should be allowable for the same reasons as claim 16, and additionally because of the further limitations each claim recites. Applicants therefore respectfully request that the rejection of claims 17-19 under 35 U.S.C. §103(a) be reconsidered and withdrawn.

Claim Rejections - 35 U.S.C. §112

The Office Action states that claims 16-20 are rejected under 35 U.S.C. §112, first paragraph for failing to show in the specification the invention recited in the claims to permit one of ordinary skill in the art to make and use the invention. The rejection is respectfully traversed.

Applicants note that the required standard for one of ordinary skill in the art to make and use the invention is that the invention is recited with a reasonable degree of certainty, or is otherwise well known such that a reasonable level of skill in the art may be assumed. Applicants have disclosed in the specification both a lifting scheme and a correction method for accomplishing a wavelet transform. It should be abundantly clear to one of ordinary skill in the art, and not require anything more than routine knowledge in the art to select either a lifting scheme or a correction method among the wavelet transform techniques disclosed in the specification to accomplish the present invention recited in claims 16-20. Accordingly, Applicants respectfully submit that the rejection of claims 16-20 under 35 U.S.C. §112, first paragraph, is overcome, and respectfully requests that they be reconsidered and withdrawn.

Conclusion

Applicants respectfully believe that the foregoing is a complete and accurate response to all issues raised in the most recent Office Action. In view of the above discussion and amendments, Applicants respectfully believe that the present application is now in condition for allowance, and earnestly solicit notice to that effect. If it is believed that an interview would

contribute to progress in the application, the Examiner is requested to contact the undersigned counsel at the number provided below.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Commissioner of Patents and Trademarks, P.O. Box 1450, Alexandria, VA 22313-1450, on May 25, 2004

Brendan J. Kennedy
Name of applicant, assignee or
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Signature
May 25, 2004
Date of Signature

Respectfully submitted,


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